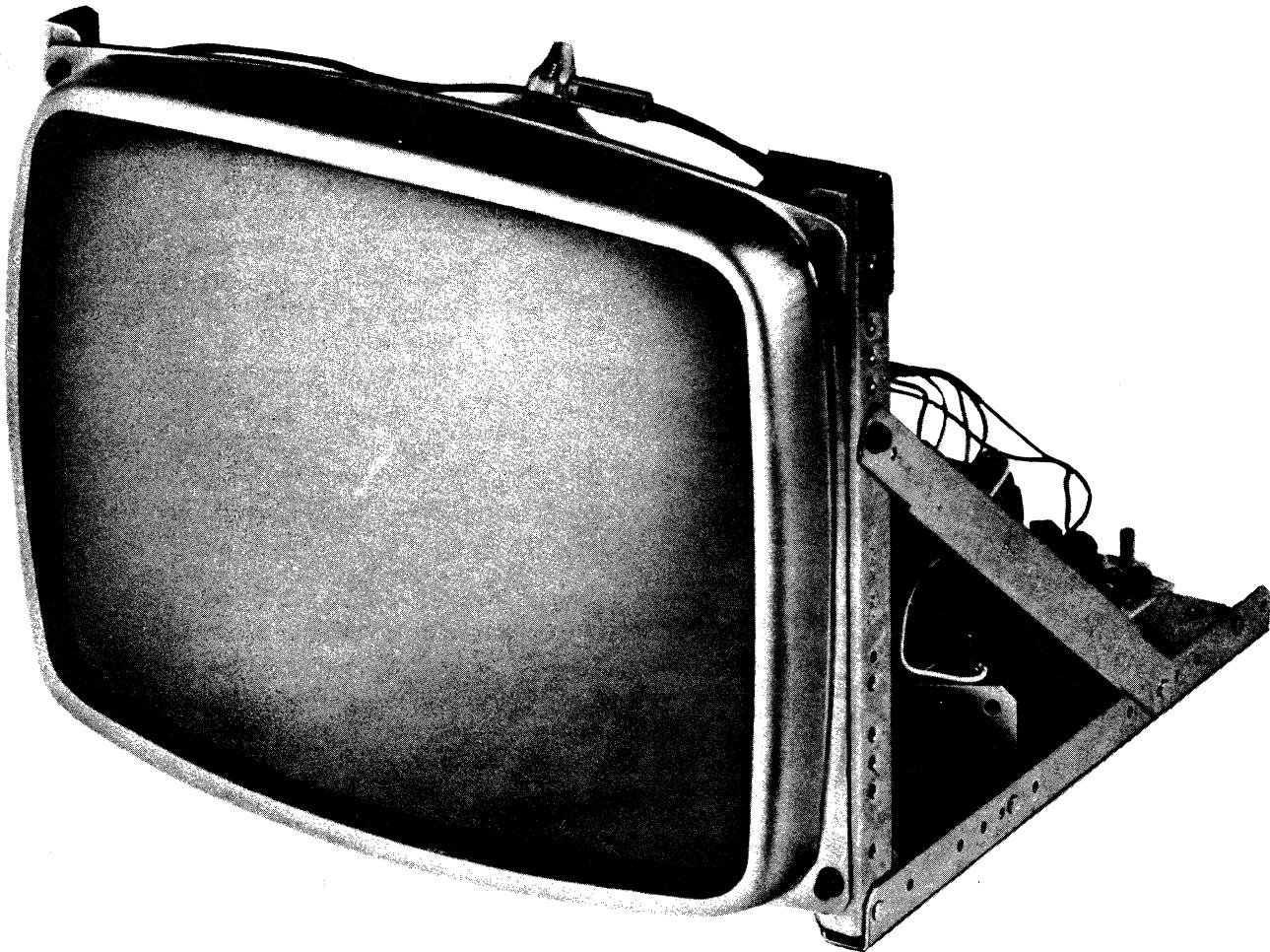


DT1



DT1

# SERVICE MANUAL



**DT1**

**D12 SERIES DATA DISPLAY TERMINALS**

**ZENITH RADIO CORPORATION**

**1000 MILWAUKEE AVENUE, GLENVIEW, ILLINOIS 60025**

DT-1  
5CRR

PRINTED IN U.S.A.  
NOV., 1978

\$2.00  
923-924

# PRODUCT SAFETY SERVICING GUIDELINES FOR ZENITH DATA DISPLAY TERMINALS

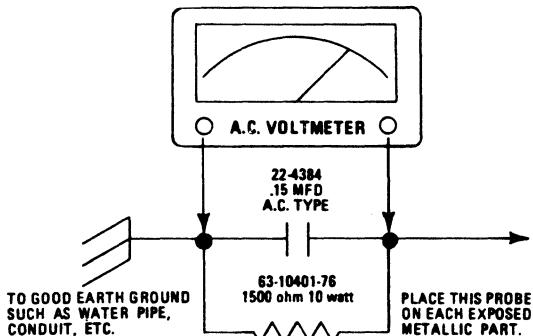
**CAUTION:** No modification of any circuit should be attempted. Service work should be performed only after you are thoroughly familiar with all of the following safety checks and servicing guidelines. To do otherwise increases the risk of potential hazards and injury to the user.

## SAFETY CHECKS

After the original service problem has been corrected, a check should be made of the following:

### SUBJECT: FIRE & SHOCK HAZARD

1. Be sure that all components are positioned in such a way to avoid possibility of adjacent component shorts. This is especially important on those chassis which are transported to and from the repair shop.
2. Never release a repair unless all protective devices such as insulators, barriers, covers, shields, strain reliefs, and other hardware have been reinstalled per original design.
3. Soldering must be inspected to uncover possible cold solder joints, frayed leads, damaged insulation, solder splashes or sharp solder points. Be certain to remove all loose foreign material.
4. Check "across-the-line" capacitor (if used) and other components for physical evidence of damage or deterioration and replace if necessary. Follow original layout, lead length and dress.
5. No lead or component should touch a resistor rated at 1 watt or more. Lead tension around protruding metal surfaces must be avoided.
6. All critical components (shaded on the schematic diagram and parts lists) such as: fuses, flameproof resistors, capacitors, etc., must be replaced with exact Zenith types. Do not use replacement components other than those specified or make unrecommended circuit modifications.
7. After re-assembly of the terminal always perform an AC leakage test on all exposed metallic parts of the cabinet and screws to be sure the terminal is safe to operate without danger of electrical shock. DO NOT USE A LINE ISOLATION TRANSFORMER DURING THIS TEST. Use an AC voltmeter having 5000 ohms per volt or more sensitivity in the following manner: Connect a 1500 ohm 10 watt resistor (63-10401-76), paralleled by a 0.15 mfd., 150V AC type capacitor (22-4384) between a known good earth ground (water pipe, conduit, etc.) and the exposed metallic parts, one at a time. Measure the AC voltage across the combination 1500 ohm resistor and 0.15 mfd. capacitor. Reverse the AC plug and repeat AC voltage measurements for each exposed metallic part. Voltage measured must not exceed 0.75 volts RMS. This corresponds to 0.5 milliamp AC. Any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.



### SUBJECT: IMPLOSION PROTECTION

1. All Zenith picture tubes are equipped with an integral implosion protection system, but care should be taken to avoid damage during installation. Avoid scratching the tube.
2. Use only Zenith replacement tubes.

### SUBJECT: X-RADIATION

1. Be sure procedures and instructions to all service personnel cover the subject of X-radiation. The only potential source of X-rays is the picture tube. However, this tube does not emit X-rays when the HV is at the factory-specified level. It is only when the HV is excessive that X-radiation can be generated. The basic precaution which must be exercised is to keep the HV at the factory-recommended level. Refer to the X-ray Precaution Label which is located inside each terminal for the correct high voltage. The proper value is also given in the schematic diagram. Operation at higher voltages may cause a failure of the picture tube or high voltage supply and, also, under certain circumstances, may produce radiation in excess of desirable levels.
2. Only Zenith-specified CRT anode connectors must be used.
3. It is essential that the serviceman has available at all times an accurate high voltage meter. The calibration of this meter should be checked periodically against a reference standard.
4. When the high voltage circuitry is operating properly there is no possibility of an X-radiation problem. Every time a chassis is serviced, the brightness should be run up and down while monitoring the high voltage with a meter to be certain that the high voltage does not exceed the specified value and that it is regulating correctly. We suggest that you and your service organization review test procedures so that voltage regulation is always checked as a standard servicing procedure, and that the reason for this prudent routine be clearly understood by everyone.
5. When trouble shooting and making test measurements in a terminal with a problem of excessive high voltage, do not operate the chassis longer than is necessary to locate the cause of excessive voltage.

### IMPORTANT NOTE: DAG GROUNDING.

Each unit provides for grounding of the main P.C. Board and CRT socket board to the dag of the CRT through the dag grounding spring.

The ground wires are connected to the shell bond or T-band through a terminal lug. Upon installing the Video Display in a terminal, this grounding procedure should be followed to provide adequate high voltage filtering and arc protection. This especially pertains to mounting the video display as a kit version.

## CAUTION

NO WORK SHOULD BE ATTEMPTED ON  
ANY EXPOSED MONITOR CHASSIS BY  
ANYONE NOT FAMILIAR WITH SERVICING  
PROCEDURES AND PRECAUTIONS.

## GENERAL INFORMATION

This service manual introduces the Zenith D12 series of Video Displays. The series includes three basic forms: the D12-PF which is complete with power supply and frame, the D12-NF without power supply, the D12-NK in kit form which comes without frame or power supply.

The D12 series incorporate precision CRT's which provide uniformity of display and controlled spot size and geometry. The display may be operated from a standard 15 volt D.C. supply (or optional 12 V.D.C.) or from 120 volts A.C.

Input and output connections for the displays are made through a 10 pin edge connector on the main circuit board. Provision has been made for an optional remote brightness control. Schematic reference numbers are printed on

the circuit board to aid in the location and identification of components for servicing.

Vertical and horizontal linearity is maintained within specifications without the use of linearity controls or adjustable devices. Excellent vertical linearity is assured by the extensive use of current feedback and horizontal linearity is achieved with a fixed saturable reactor.

Vertical and horizontal deflection systems sustain scan even in the absence or interruption of synchronizing signals. Vertical and horizontal synchronization is automatic and stable throughout the entire specified operating frequency range.

## SPECIFICATIONS

### CATHODE RAY TUBE

12" diagonal measure, 90° deflection, 12.5 KV nominal high voltage at 50  $\mu$ A. beam current. Available with bonded anti-reflective face plate option. P4 phosphor is standard and other EIA phosphors are available.

### NOMINAL DISPLAY AREA

51 sq. in. defined by a rectangle 8 1/2" x 6" centered on the CRT. (Other display dimensions optional.)

### INPUT SIGNALS (TTL LEVEL)

#### HORIZONTAL

4 to 40  $\mu$ sec. duration (positive going standard).

#### VERTICAL

50 to 1400  $\mu$ sec. duration (negative going standard).

#### VIDEO

1.0V to 2.5V P-P (user supplies 500 ohm contrast control for higher input levels).

Positive polarity for white characters. (Other polarities are available for horizontal and vertical sync.)

### POWER SUPPLY

120V  $\pm$  10% or 240V  $\pm$  10%

(customer strappable) 47 to 63 Hz., or

15V DC at 800 ma. max., or

12V DC at 1100 ma. max.

### BRIGHTNESS CONTROL

Internal or Customer supplied 100 K $\Omega$  potentiometer (accessible at pins 2, 3 and 4 of edge connector).

### INTERCONNECT TO CUSTOMER SYSTEM

Via standard 10-pin edge connector.

VIKING #25V10S/1-2

AMP #225-21031-101

CINCH #250-10-30-170

### RESOLUTION

900 vertical lines minimum at center of display and 700 vertical lines at the corners. Pulse rise time less than 20 nanoseconds, for 30V rise at CRT. Bandwidth is within 3db from 10 Hz. to 18 MHz.

### GEOMETRY

NOTE: Measurements made with an input of 1.0-2.5V P-P and with the display adjusted to 6" high x 8 1/2" wide.

#### VERTICAL

a. Height of display at left side shall be within  $\pm$  2.0 percent of height at right side.

b. Top and bottom pincushion or barrel shall be within 1.25% of the average height.

### HORIZONTAL

a. Width of display at top shall be within  $\pm$  2.5 percent of width at bottom.  
b. Side pincushion or barrel shall be within 1.0% of the average width.

### LINEARITY

No character shall vary in width or height by more than  $\pm$  10% of the average width or height of all the characters in a row or column respectively. No specific character shall vary in width or height more than  $\pm$  10% of an adjacent character.

### SYNCHRONIZATION

#### HORIZONTAL

15.75  $\pm$  0.5KHz.

18.60  $\pm$  0.5KHz. (Optional)

#### Horizontal Blanking

10.0  $\mu$  sec. min.

#### Horizontal Phasing Control

10.0  $\mu$  sec. min. adjustment

#### VERTICAL

47 to 63 Hz.

#### VERTICAL RETRACE TIME

850  $\mu$ sec. max.

### STORAGE

55° C. max. with bonded anti-reflective faceplate.

65° C. max. for plain faced CRT's.

### ENVIRONMENT

#### Operating temperature

55° max. (free air temperature of display electronics).

#### Altitude

40,000 ft. + storage & shipment.

10,000 ft. max. operating.

### WEIGHT

11.5 lbs. max. without optional power supply.

13.5 lbs. max. with optional power supply.

9.0 lbs. max. without frame.

# THEORY OF OPERATION

## POWER SUPPLY

Power Transformer TX201 is designed for use with 120V or 240V A.C. source. The secondary provides power to bridge rectifier (CR501, CR502, CR503 and CR504). The positive output of the bridge rectifier (junction of CR503 and CR504), forms the raw B+ supply ( $\sim 20$ VDC).

Voltage regulation is accomplished in the negative leg of the power supply through a feedback network consisting of transistors QX501 and QX502 and their associated circuitry. The emitter voltage of QX501 is maintained by diodes CR505, CR506 and CR507. The base voltage is provided by potentiometer RX506.

If B+ increases, diodes CR505, CR506 and CR507 will draw more current to maintain the emitter voltage of QX501. Additionally, the voltage developed across RX506 will increase, resulting in a higher positive voltage at the base of QX501 which will result in less conduction. This reduces the base current of QX502 since QX501 provides the emitter/base current path for QX502. When QX502 conducts less, the voltage drop across Q502 is increased thus lowering B+.

If B+ decreases, diodes CR505, CR506 and CR507 will reduce conduction to maintain the emitter voltage of QX501. Additionally, the base voltage provided by RX506 will decrease. Less voltage on the base of QX501 will cause it to increase conduction, resulting in a greater emitter/base current flow in QX502. With this condition the voltage drop for Q502 is less and B+ is increased.

## HORIZONTAL

The low-level horizontal section, which consists of transistors Q101 and Q102 (and associated circuitry), functions as a variable time delay monostable multivibrator. The input trigger for this circuit is provided by the horizontal drive pulse. The pulse is injected into the base or emitter (for either positive or negative pulse respectively) of Q101 through injection network C101, C111, R101, R110 and CR101. By varying the recovery time of the multivibrator, potentiometer R104 adjusts video information position (with respect to raster scan). Output of the monostable multivibrator, derived at the collector of Q102, is injected through a coupling network consisting of C110 and CR103. The resulting "Lock" signal is rereceived by one side of a precision astable multivibrator at the

emitter of Q103. The astable multivibrator circuit is completed through Q104 and associated circuitry. This circuit will act as a free running oscillator until the "Lock" signal is received from the previous stage. Once locked, an output pulse is formed at the emitter of Q104 which is then D.C. coupled to the base of the horizontal driver transistor, Q105.

Remainder of the horizontal circuit is straightforward. Features to be noted are: Width and Linearity Coils LX102 and LX101 in series with the yoke (TX202). Linearity is fixed and an adjustable coil is provided for width. The linearity coil has a magnetically biased core which makes the inductance of the coil dependent upon its current. Pincushion and geometric corrections are made at the factory by the addition of rubber magnets around the plastic ring of the yoke. D.C. operation of 12 volts is accomplished by the (optional) addition of a boost circuit at the horizontal sweep transformer.

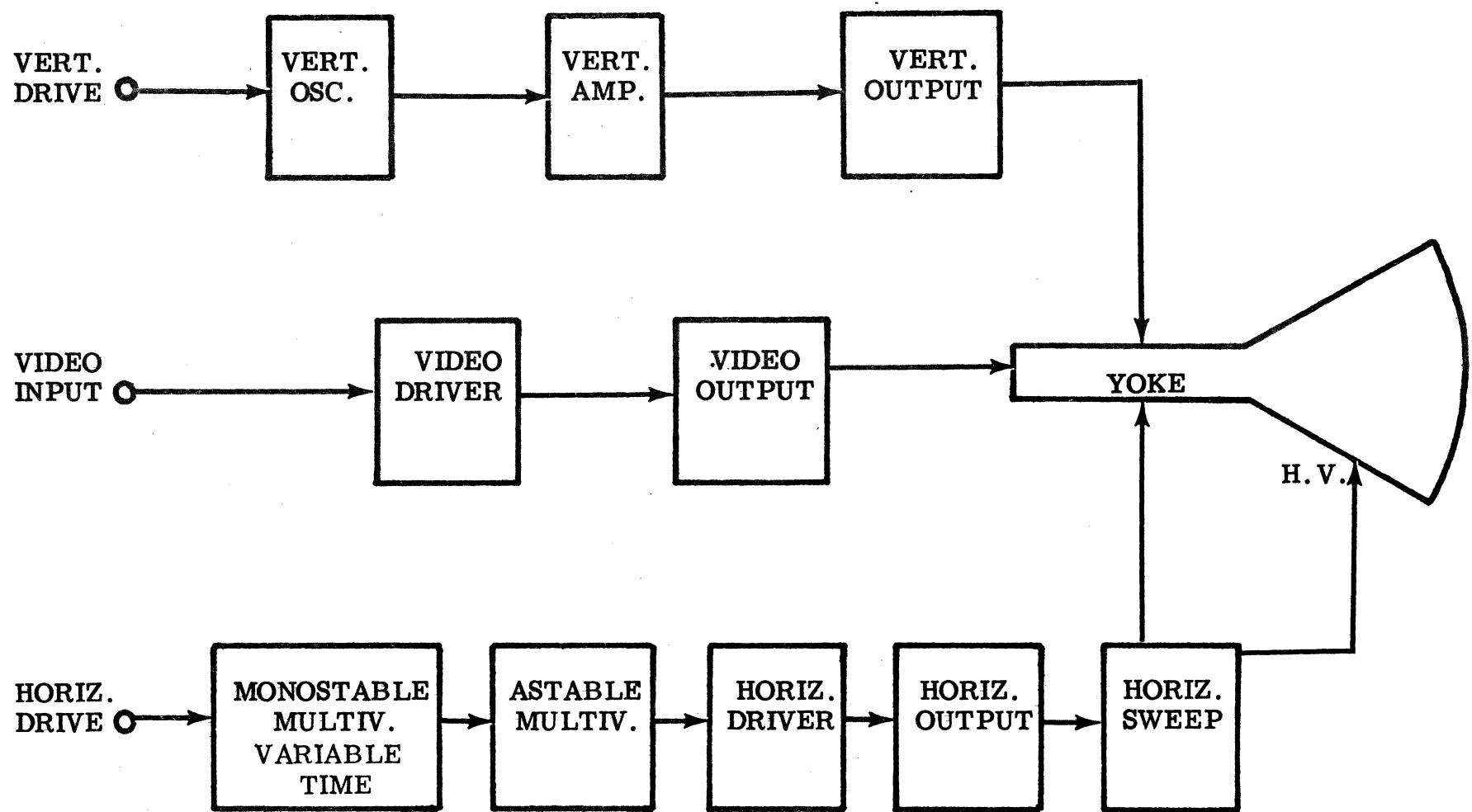
## VERTICAL

The vertical circuit includes an oscillator consisting of transistors Q301 and Q302 and associated circuitry. Amplification is provided by transistors Q303 and Q304 with the emitter of Q304 feeding the base of the vertical driver Q305. The vertical output transistors, Q306 and Q307 are wired in the standard push-pull configuration. One feature of this vertical circuit is the addition of transistor Q308. This transistor doubles B+ during retrace, thus maintaining less than  $800\mu$  sec. of retrace time.

## VIDEO

The video amplifier circuit consists of transistors Q401 and Q402 and associated circuitry. The circuit comprises a cascode amplifier which is triggered by a positive pulse at pin 8 of the edge connector. Upon receiving the input pulse, conduction is initiated and the collector voltage of Q402 is lowered. Amplification of low frequency voltage gain is fixed by the ratio of R407 and R408. Gain is maintained to 18 MHz by the bandwidth enhancing components R406, C403, and L401. Resistors R402 and R403 provide bias for the amplifier.

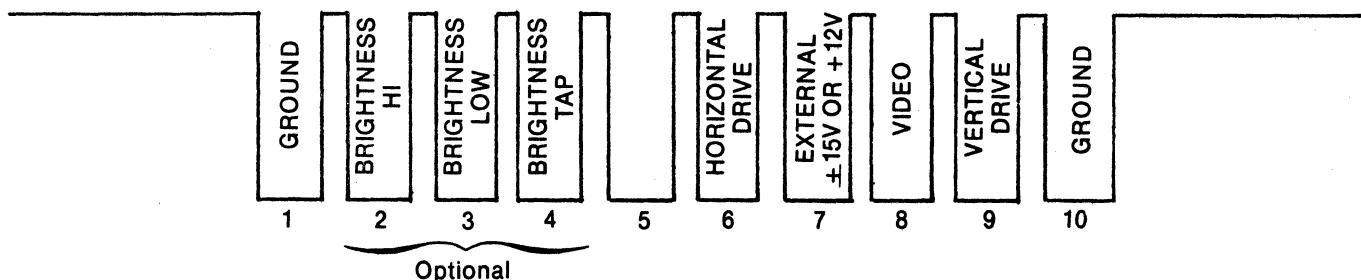
The collector output of Q401 is D.C. coupled to the cathode of the C.R.T. through resistor R201. Raster cut-off is adjusted with the brightness control R114 which is connected to G1 of the C.R.T.



# ADJUSTMENT PROCEDURES FOR D12 VIDEO DISPLAY

1. External power is applied to the monitor through an AC line cord or a 4 pin molex connector. The unit is wired for 120 VAC 50/60 Hz operation. (240 VAC 50/60 Hz optional)
2. INPUT SIGNALS: Input signals are connected to the display board through a 10 pin edge connector.

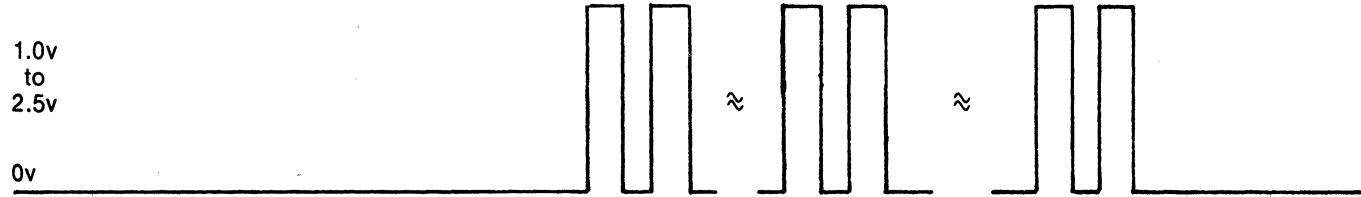
Component Side of Display Board



A. Horizontal drive signal — 15750 Hz  $\pm$  500 Hz

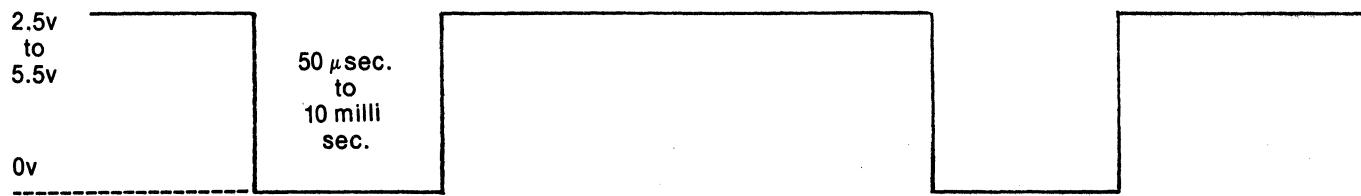


B. Video drive signal



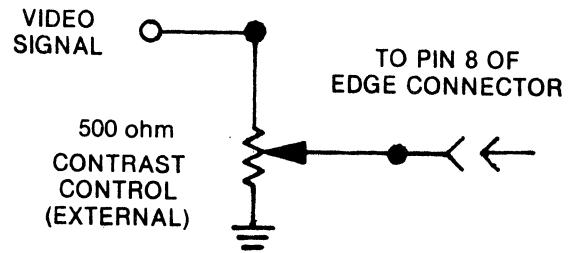
At a horizontal frequency of 15.7KHZ the video drive signal should start 11 microseconds  $\pm$  5  $\mu$  sec. after the leading edge of horizontal sync, and 900 microseconds or greater after the leading edge of vertical sync.

C. Vertical drive signal — 47 Hz to 63 Hz



In normal operation the horizontal and vertical drive signals and signal ground are connected to the edge connector through a cable assembly. If this is not the case connect pins 1 & 10 together with a jumper wire at the edge connector.

Should the video drive level exceed the 2.5 volts specified, an external contrast control must be provided. The video drive signal is connected to the top end of the  $500\ \Omega$  pot, the bottom end is grounded and the wiper arm connects to the video input of the edge connector as shown.

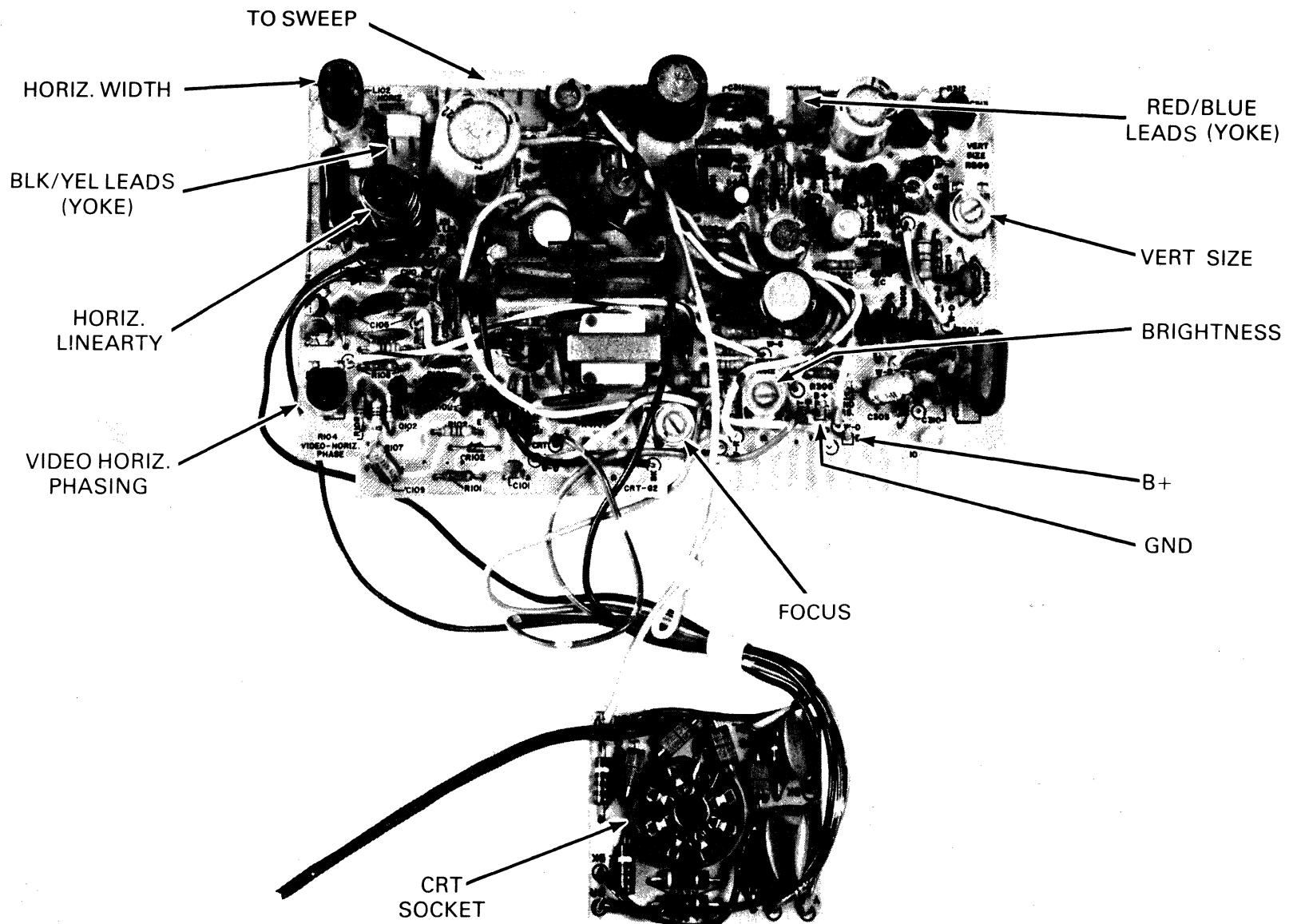


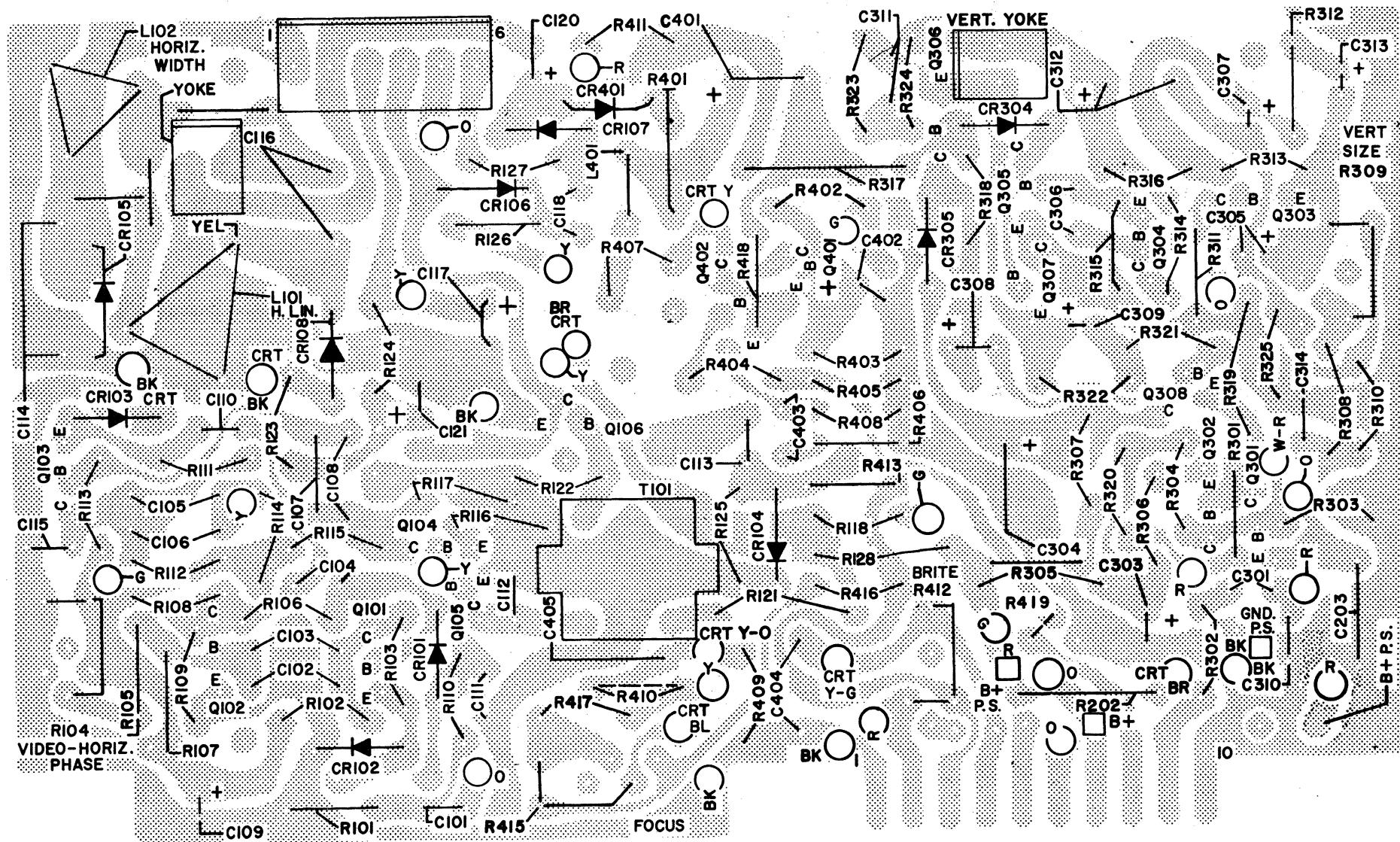
3. Once power is applied to the display and the input signals connected, adjust the brightness control until the edges of the raster are visible.
4. Depending on the requirements for height and width of the video presentation, the vertical size control and width coil should be adjusted accordingly.
5. The power supply board also has a control to adjust the regulated B+ of the monitor to +15V. Check for proper adjustment.
6. Adjust the phase control to center the video information within the raster. (The contrast control may have to be adjusted to obtain a display of the video information.)
7. Adjust brightness control for visual cutoff of the raster.
8. Adjust external contrast control for desired luminance.
9. Adjust focus control for best possible overall focus.

#### **IMPORTANT NOTE: DAG GROUNDING.**

Each unit provides for grounding of the main P.C. Board and CRT socket board to the dag of the CRT through the dag grounding spring.

The ground wires are connected to the shell bond or T-band through a terminal lug. Upon installing the Video Display in a terminal, this grounding procedure should be followed to provide adequate high voltage filtering and arc protection. This especially pertains to mounting the video display as a kit version.

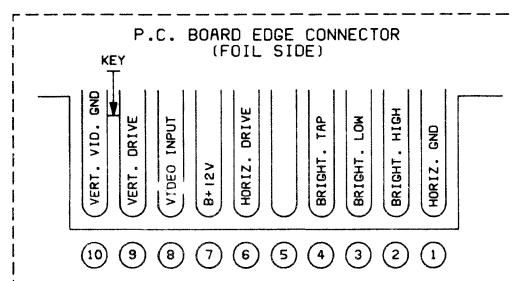
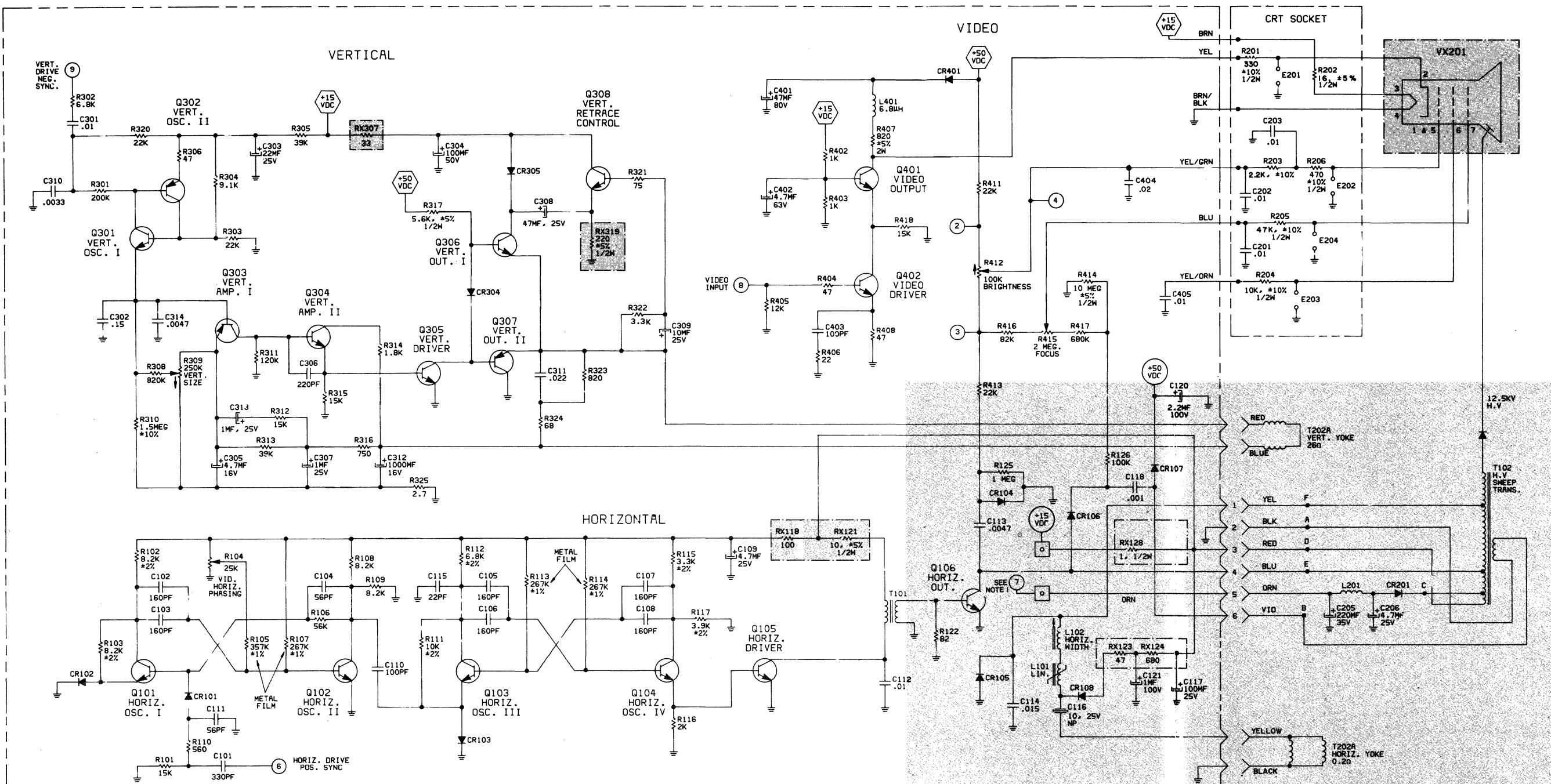




## LEGEND

ITEM NO.	PART NO.	DESCRIPTION	ITEM NO.	PART NO.	DESCRIPTION
C101	22-7614-06A	330 PFD CAPACITOR 20% DISC 50V	R303	63-9922-04	22K OHM RESISTOR 5% FILM 1/4W
C102	22-7619-39A	160 PFD CAPACITOR 5% DISC NPO 50V	R304	63-9921-95	9.1K OHM RESISTOR 5% FILM 1/4W
C103	22-7619-39A	160 PFD CAPACITOR 5% DISC NPO 50V	R305	63-9922-10	39K OHM RESISTOR 5% FILM 1/4W
C104	22-7622-28A	56 PFD CAPACITOR 10% DISC NPO 50V	R306	63-9921-40	47 OHM RESISTOR 5% FILM 1/4W
C105	22-7619-39A	160 PFD CAPACITOR 5% DISC NPO 50V	RX307	63-10559-36	33 OHM RESISTOR 5% FILM 1/4W
C106	22-7619-39A	160 PFD CAPACITOR 5% DISC NPO 50V	R308	63-9922-42	820K OHM RESISTOR 5% FILM 1/4W
C107	22-7619-39A	160 PFD CAPACITOR 5% DISC NPO 50V	R309	63-10651-08	CONTROL 250K OHM VERT SIZE
C108	22-7619-39A	160 PFD CAPACITOR 5% DISC NPO 50V	R310	63-9924-48	1.5 MEGOHM RESISTOR 10% FILM 1/4W
C109	22-7152-03	4.7 MFD CAPACITOR +100%—10% ELEC 25V	R311	63-9922-22	120K OHM RESISTOR 5% FILM 1/4W
C110	22-7613A	100 PFD CAPACITOR 10% DISC 50V	R312	63-9922	15K OHM RESISTOR 5% FILM 1/4W
C111	22-7622-28A	56 PFD CAPACITOR 10% DISC 50V	R313	63-9922-10	39K OHM RESISTOR 5% FILM 1/4W
C112	22-7613-24A	.01 MFD CAPACITOR 10% DISC 50V	R314	63-9921-78	1.8K OHM RESISTOR 5% FILM 1/4W
C113	22-7440	.0047 MFD CAPACITOR 10% DISC 500V	R315	63-9922	15K OHM RESISTOR 5% FILM 1/4W
CX114	22-7530-07	.015 MFD CAPACITOR 5% POLYESTER 400V	R316	63-9921-69	750 OHM RESISTOR 5% FILM 1/4W
C115	22-7656-13A	22 PFD CAPACITOR 10% DISC 50V	R317	63-7816	5.6K OHM RESISTOR 5% CARBON COMP 1/2W
C116	22-7313	10 MFD CAPACITOR 20% NPF ELEC 25V	R318		
C117	22-7718-09	100 MFD CAPACITOR 20% ELEC 25V	RX319	63-10565-56	220 OHM RESISTOR 5% FILM 1/2W
CX118	22-3748	.001 MFD CAPACITOR 10% DISC 1KV	R320	63-9922-04	22K OHM RESISTOR 5% FILM 1/4W
C119			R321	63-9921-45	75 OHM RESISTOR 5% FILM 1/4W
C120	22-7722-02	2.2 MFD CAPACITOR 20% ELEC 100V	R322	63-9921-84	3.3K OHM RESISTOR 5% FILM 1/4W
C121	22-7722-01	1 MFD CAPACITOR 20% ELEC 100V	R323	63-9921-70	820 OHM RESISTOR 5% FILM 1/4W
C201	22-4905-01	.01 MFD CAPACITOR +80%—20% 500V	R324	63-9921-44	68 OHM RESISTOR 5% FILM 1/4W
C202	22-4905-01	.01 MFD CAPACITOR +80%—20% 500V	R325	63-9921-10	2.7 OHM RESISTOR 5% FILM 1/4W
C203	22-4905-01	.01 MFD CAPACITOR +80%—20% 500V	R401		
C204			R402	63-9921-72	1K OHM RESISTOR 5% FILM 1/4W
CX205	22-7144-09	220 MFD CAPACITOR +100%—10% ELEC 35V	R403	63-9921-72	1K OHM RESISTOR 5% FILM 1/4W
CX206	22-7142-03	4.7 MFD CAPACITOR +100%—10% ELEC 25V	R404	63-9921-40	47 OHM RESISTOR 5% FILM 1/4W
C301	22-7613-24A	.01 MFD CAPACITOR 10% DISC 50V	R405	63-9921-98	12K OHM RESISTOR 5% FILM 1/4W
C302	22-7548	.15 MFD CAPACITOR 10% POLYESTER 50V	R406	63-9921-32	22 OHM RESISTOR 5% FILM 1/4W
C303	22-7152-05	22 MFD CAPACITOR +100%—10% ELEC 25V	R407	63-10371-70	820 OHM RESISTOR 5% FILM 2W
C304	22-7720-09	100 MFD CAPACITOR 20% ELEC 50V	R408	63-9921-40	47 OHM RESISTOR 5% FILM 1/4W
C305	22-7579-03	4.7 MFD CAPACITOR ELEC 16V	R409		
C306	22-7614-04A	220 PFD CAPACITOR 20% DISC 50V	R410		
C307	22-7389-02	1 MFD CAPACITOR 20% ELEC 25V	R411	63-9922-04	22K OHM RESISTOR 5% FILM 1/4W
C308	22-7718-08	47 MFD CAPACITOR 20% ELEC 25V	R412	63-10651-05	CONTROL 100K OHM BRIGHTNESS
C309	22-7152-04	10 MFD CAPACITOR +100%—10% ELEC 25V	R413	63-9922-04	22K OHM RESISTOR 5% FILM 1/4W
C310	22-7614-18A	.0033 MFD CAPACITOR 20% DISC 50V	R414	63-7952	10 MEGOHM RESISTOR 5% CARBON 1/2W
C311	22-7615-08A	.022 MFD CAPACITOR +80%—20% DISC 50V	R415	63-10651-07	CONTROL 2 MEGOHM FOCUS
C312	22-7579-04	1000 MFD CAPACITOR 10% ELEC 16V	R416	63-9922-18	82K OHM RESISTOR 5% FILM 1/4W
C313	22-7389-02	1 MFD CAPACITOR 20% ELEC 25V	R417	63-9922-40	680K OHM RESISTOR 5% FILM 1/4W
C314	22-7614-20A	.0047 MFD CAPACITOR 20% DISC 50V	R418	63-9922	15K OHM RESISTOR 5% FILM 1/4W
C315			R419		
C401	22-7722-08	47 MFD CAPACITOR 20% ELEC 100V	L101	20-3906	COIL, RCF LINEARITY
C402	22-7721-04	4.7 MFD CAPACITOR 20% ELEC 63V	LX102	20-3882	COIL, RCF TUNABLE WIDTH
C403	22-7613A	100 PFD CAPACITOR 10% DISC 50V	LX201	20-3824	COIL, HORIZ FILTER
C404	22-7724	.02 MFD CAPACITOR +80%—20% DISC 500V	L401	20-3887-10C	COIL, RCF 6.8 uH
R101	63-9922	.01 MFD CAPACITOR +40%—10% DISC 1KV	T101	95-3136-03	TRANSFORMER HORIZ DRIVER
R102	63-9919-94	15K OHM RESISTOR 5% FILM 1/4W	TX102	95-3395-01	HV SWEEP TRANSFORMER
R103	63-9919-94	8.2K OHM RESISTOR 2% FILM 1/4W	TX202 A, B	95-3397	DEFLECTION YOKE
R104	63-10651-06	8.2K OHM RESISTOR 2% FILM 1/4W	CR101	103-142-01	DIODE
R105	63-10533-05	CONTROL 25K OHM (HORIZ PHASE)	CR102	103-142-01	DIODE
R106	63-9922-14	357K OHM RESISTOR 1% METAL FILM 1/4W	CR103	103-142-01	DIODE
R107	63-10533-04	56K OHM RESISTOR 5% FILM 1/4W	CR104	103-261-04A	DIODE
R108	63-9921-94	267K OHM RESISTOR 1% METAL FILM 1/4W	CR105	103-263A	DIODE
R109	63-9921-94	8.2K OHM RESISTOR 5% FILM 1/4W	CR106	212-76	DIODE
R110	63-9921-66	560 OHM RESISTOR 5% FILM 1/4W	CR107	103-298-04	DIODE
R111	63-9919-96	10K OHM RESISTOR 2% FILM 1/4W	CR108	103-261-02A	DIODE
R112	63-9919-92	6.8K OHM RESISTOR 2% FILM 1/4W	CR201	103-280-02	DIODE ALT: 103-263 (2) IN PARALLEL
R113	63-10533-04	267K OHM RESISTOR 1% METAL FILM 1/4W	CR301		
R114	63-10533-04	267K OHM RESISTOR 1% METAL FILM 1/4W	CR302		
R115	63-9919-84	3.3K OHM RESISTOR 2% FILM 1/4W	CR303		
R116	63-9921-79	2K OHM RESISTOR 5% FILM 1/4W	CR304	103-142-01	DIODE
R117	63-9919-86	3.9K OHM RESISTOR 2% FILM 1/4W	CR305	103-261-02A	DIODE
RX118	63-10559-48	100 OHM RESISTOR 5% FILM 1/4W	CR401	103-295-02A	DIODE
R119			Q101	121-975	TRANSISTOR #I HORIZ OSC
R120			Q102	121-975	TRANSISTOR #II HORIZ OSC
RX121	63-10565-24	10 OHM RESISTOR 5% FILM 1/2W	Q103	121-975	TRANSISTOR #III HORIZ OSC
R122	63-9921-46	82 OHM RESISTOR 5% FILM 1/4W	Q104	121-975	TRANSISTOR #IV HORIZ OSC
RX123	63-10559-40	47 OHM RESISTOR 5% FILM 1/4W	Q105	121-819	TRANSISTOR HORIZ DRIVER
RX124	63-10559-68	680 OHM RESISTOR 5% FILM 1/4W	QX106	121-1039	TRANSISTOR HORIZ OUTPUT
R125	63-9922-44	1 MEGOHM RESISTOR 5% FILM 1/4W	Q301	121-975	TRANSISTOR #I VERT OSC
R126	63-9922-20	100K OHM RESISTOR 5% FILM 1/4W	Q302	121-699	TRANSISTOR #II VERT OSC
RX127			Q303	121-699	TRANSISTOR #I VERT AMP
RX128	63-10565	1 OHM RESISTOR 5% FILM 1/2W	Q304	121-975	TRANSISTOR #II VERT AMP
R201	63-7763	330 OHM RESISTOR 5% CARBON COMP 1/2W	Q305	121-972	TRANSISTOR VERT DRIVER
R202	63-7710	16 OHM RESISTOR 5% CARBON COMP 1/2W	Q306	121-819	TRANSISTOR VERT OUTPUT I
R203	63-7799	2.2K OHM RESISTOR 10% CARBON COMP 1/2W	Q307	121-973	TRANSISTOR VERT OUTPUT II
R204	63-7827	10K OHM RESISTOR 10% CARBON COMP 1/2W	Q308	121-819	TRANSISTOR VERT RETRACE CONTROL
R205	63-7855	47K OHM RESISTOR 10% CARBON COMP 1/2W	Q401	121-1034	TRANSISTOR VIDEO OUTPUT
R206	63-7771	470 OHM RESISTOR 10% CARBON COMP 1/2W	Q402	121-895	TRANSISTOR VIDEO DRIVER
R301	63-9922-27	200K OHM RESISTOR 5% FILM 1/4W	E201	52-2240-01	SPARK GAP (PART OF CRT SOCKET ASSY)
R302	63-9921-92	6.8K OHM RESISTOR 5% FILM 1/4W	E202	52-2240-01	SPARK GAP (PART OF CRT SOCKET ASSY)
			E203	52-2240-01	SPARK GAP (PART OF CRT SOCKET ASSY)
			E204	52-2240-01	SPARK GAP (PART OF CRT SOCKET ASSY)
			VX201	100-684	12" CRT OR
				100-684-02	12" CRT

# D12 VIDEO DISPLAY 15.7KHz



○ = DC VOLTAGE SOURCE

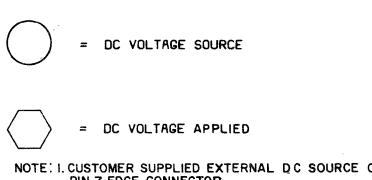
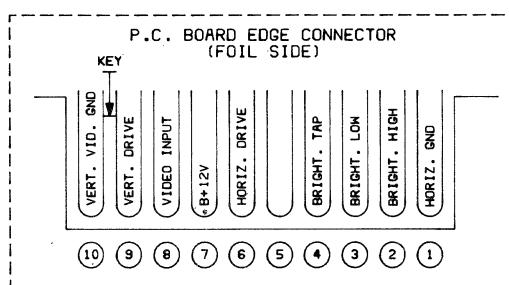
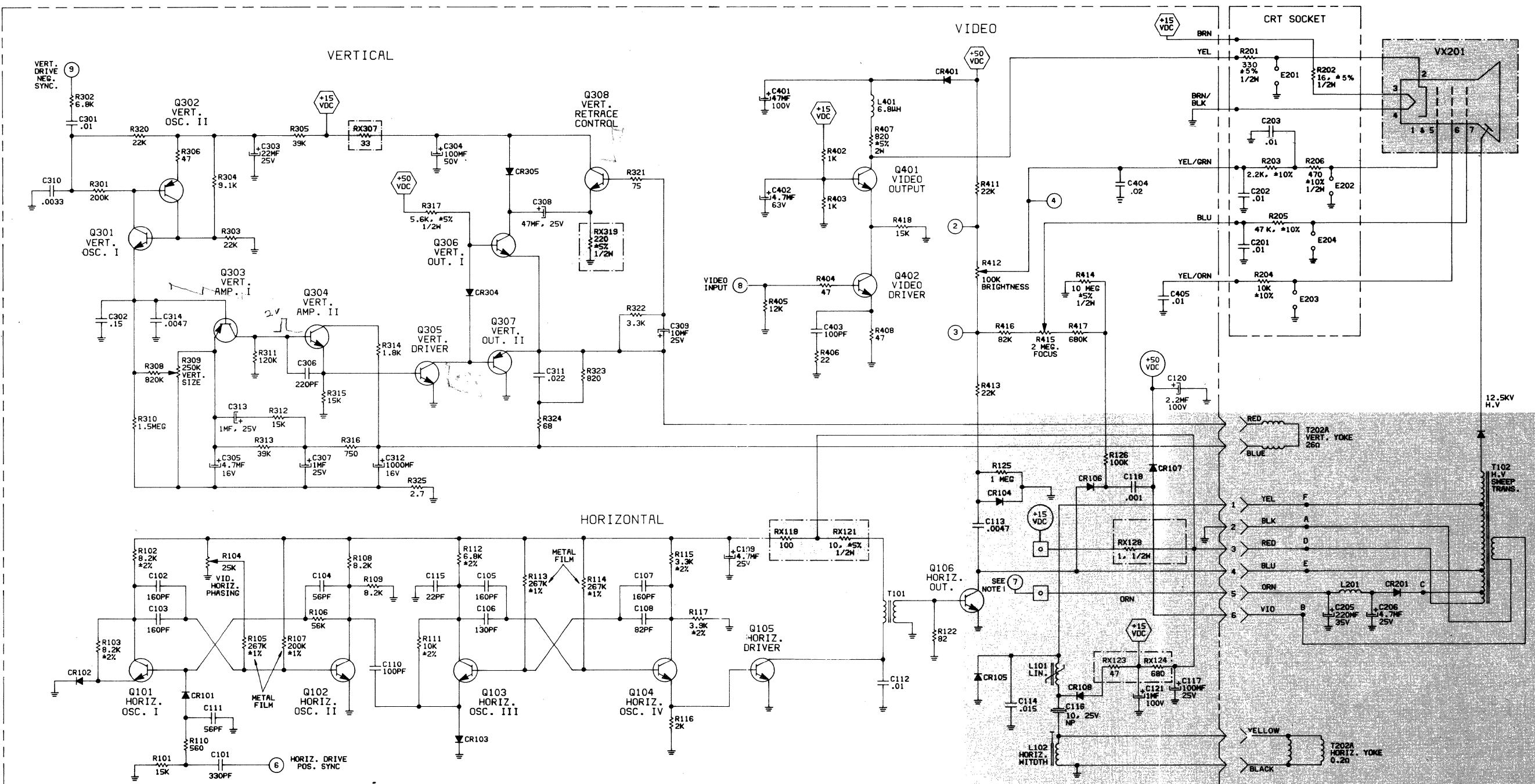
◇ = DC VOLTAGE APPLIED

NOTE: 1. CUSTOMER SUPPLIED EXTERNAL DC SOURCE ON PIN 7 EDGE CONNECTOR

**IMPORTANT SAFETY NOTICE**  
 When servicing this chassis, under no circumstances should the original design be modified or altered without permission from the Zenith Radio Corporation. All components should be replaced only with types identical to those in the original circuit. Special components are used to prevent shock and fire hazard. These critical components are shaded on the schematic and parts list for easy identification.  
 This circuit diagram may occasionally differ from the actual circuit used. This way, implementation of the latest safety and performance improvement changes into the set is not delayed until the new service literature is printed.

**IMPORTANT SAFETY NOTICE**  
**FOR X-RADIATION, FIRE OR SHOCK HAZARD PREVENTION, CERTAIN SPECIAL OR REDUNDANT PARTS ARE USED. USE ONLY EXACT REPLACEMENTS. DO NOT ALTER THE CIRCUIT OR DEFEAT THE FUSES. FAILURE TO COMPLY MAY BE UNLAWFUL.**

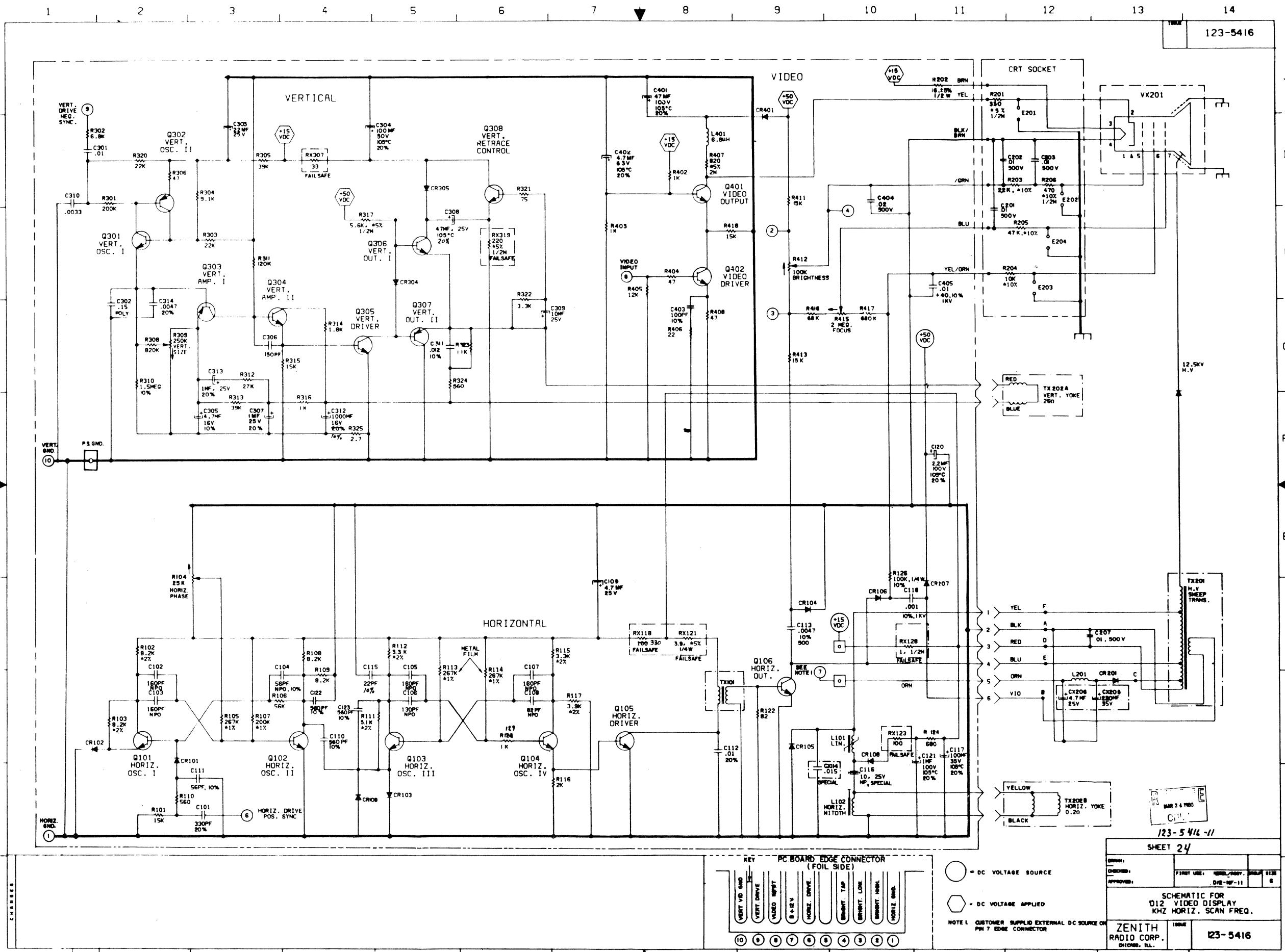
# D12 VIDEO DISPLAY 18.6KHz



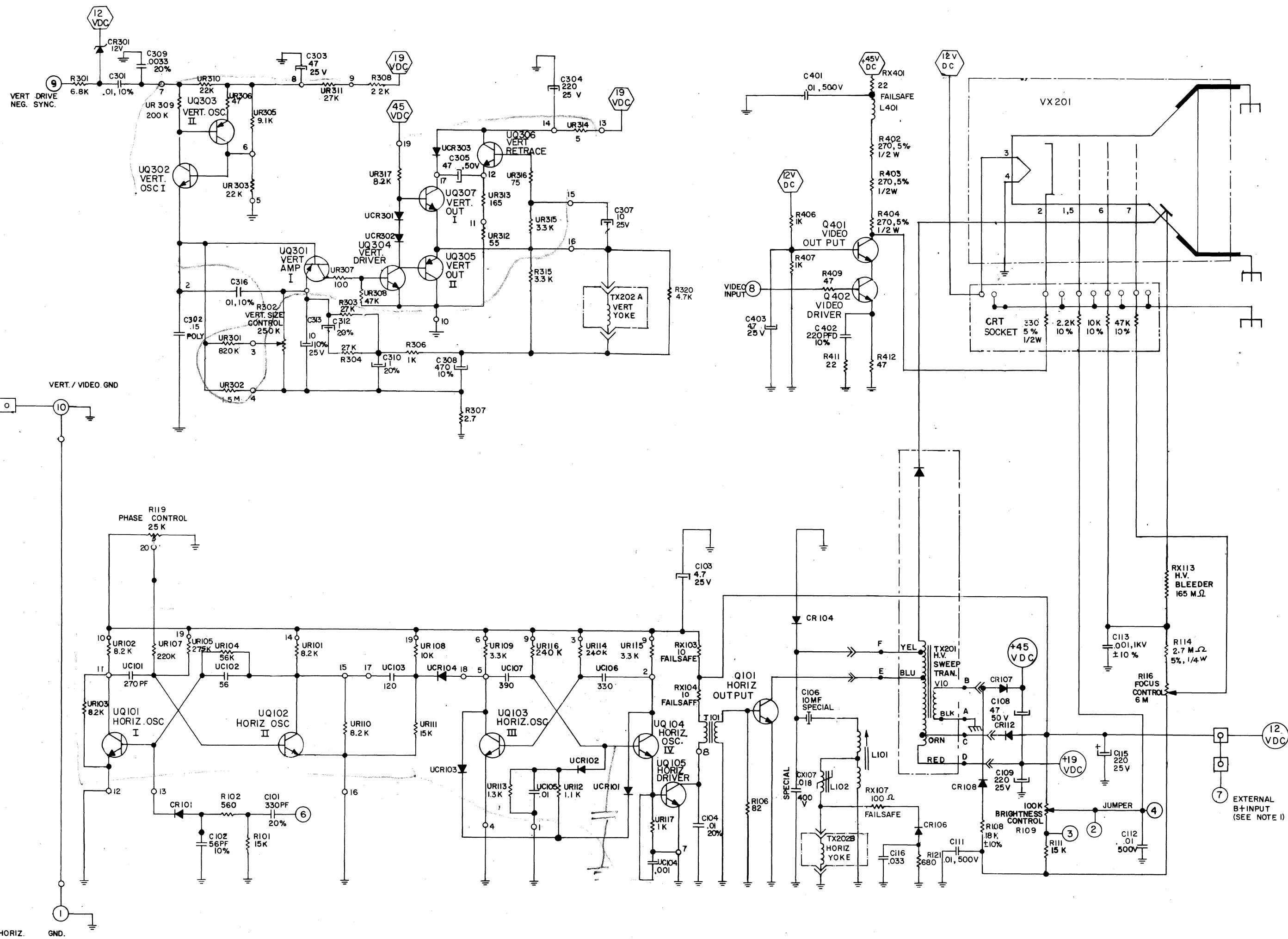
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SAMPLES OF NEW OR REVISED PART MUST BE APPROVED BY ZENITH RADIO CORPORATION BEFORE PRODUCTION. UNLESS OTHERWISE SPECIFIED IN CHARGE COLUMN, AFTER APPROVAL, MANUFACTURER SHALL NOT CHANGE THE DESIGN, PERFORMANCE, MATERIALS, OR MANUFACTURING SITE WITHOUT PRIOR NOTIFICATION AND APPROVAL BY ZENITH RADIO CORPORATION.												
1	2	3	4	5	6	7	8	9	10	11	12	
H	C101	22-7014-00A	330 PFD. CAPACITOR ±20% DISC.	50V	R101	03-0022	15K OHM RESISTOR ±5% FILM	1/40	R316	03-0021-72	1000 OHM RESISTOR ±5% FILM	1/40
	C102	22-7010-30A	100 PFD. CAPACITOR ±5% DISC. MPC	50V	R102	03-0010-84	0.2K OHM RESISTOR ±2% FILM	1/40	R317	03-7010	5.0K OHM RESISTOR ±5% CARBON COMP.	1/40
	C103	22-7010-30A	100 PFD. CAPACITOR ±5% DISC MPC	50V	R103	03-0010-84	0.25 OHM RESISTOR ±2% FILM	1/40	R318			
	C104	22-7022-20A	50 PFD CAPACITOR ±10% DISC	50V	R104	03-10651-11	CONTROL 25K OHM (HORIZ. PHASE)		R319	03-10645-68	220 OHM RESISTOR ±5% FAILSAFE	1/40
	C105	22-7010-30A	100 PFD CAPACITOR ±5% DISC MPC	50V	R105	03-10533-04	207K OHM RESISTOR ±15% (METAL FILM)	1/40	R320	03-0021-84	22K OHM RESISTOR ±5% FILM	1/40
	C106	22-7010-30A	100 PFD CAPACITOR ±5% DISC MPC	50V	R106	03-0022-14	50K OHM RESISTOR ±5% FILM	1/40	R321	03-0021-40	75 OHM RESISTOR ±5% FILM	1/40
	C107	22-7010-30A	100 PFD CAPACITOR ±5% DISC MPC	50V	R107	03-10531-11	200K OHM RESISTOR ±15% METAL FILM	1/40	R322	03-0021-84	0.3K OHM RESISTOR ±5% FILM	1/40
	C108	22-7010-32E	02 PFD CAPACITOR ±5% DISC MPC	50V	R108	03-0021-84	0.2K OHM RESISTOR ±5% FILM	1/40	R323	03-0021-73	1100 OHM RESISTOR ±5% FILM	1/40
	C109	22-7152-03	4.7 MFD CAPACITOR ±100% 105°C ELEC	25V	R109	03-0021-84	0.2K OHM RESISTOR ±5% FILM	1/40	R324	03-0021-66	560K OHM RESISTOR ±5% FILM	1/40
	C110	22-7013-00A	560 PFD CAPACITOR ±10% DISC	50V	R110	03-0021-40	560K OHM RESISTOR ±5% FILM	1/40	R325	03-0021-10	2.7 OHM RESISTOR ±5% FILM	1/40
G	C111	22-7022-20A	50 PFD CAPACITOR ±10% DISC	50V	R111	03-10531-04	5.1K OHM RESISTOR ±2% FILM	1/40	R106	03-0021-40	12K OHM RESISTOR ±5% FILM	1/40
C112	22-7014-24A	.01 MFD CAPACITOR ±20% DISC	50V	R112	03-0010-84	3.3K OHM RESISTOR ±2% FILM	1/40	R401				
C113	22-7440	.0047 MFD CAPACITOR ±10% DISC	50V	R113	03-10533-04	207K OHM RESISTOR ±15% METAL FILM	1/40	R402	03-0021-72	1K OHM RESISTOR ±5% FILM	1/40	
C114	22-7530-07	.015 MFD CAPACITOR SPECIAL		R114	03-10533-04	207K OHM RESISTOR ±15% METAL FILM	1/40	R403	03-0021-72	1K OHM RESISTOR ±5% FILM	1/40	
C115	22-7050-13A	22 PFD CAPACITOR ±10% DISC	50V	R115	03-0010-84	3.3K OHM RESISTOR ±2% FILM	1/40	R404	03-0021-40	47 OHM RESISTOR ±5% FILM	1/40	
C116	22-7313	10 MFD CAPACITOR SPECIAL	25V	R116	03-0021-70	2K OHM RESISTOR ±5% FILM	1/40	R405	03-0021-40	12K OHM RESISTOR ±5% FILM	1/40	
C117	22-7710-00	100 MFD CAPACITOR ±20% ELEC. 105°C	35V	R117	03-0010-84	3.3K OHM RESISTOR ±2% FILM	1/40	R406	03-0021-37	22 OHM RESISTOR ±5% FILM	1/40	
C118	22-3740	.001 MFD CAPACITOR ±10% DISC	1KV	R118	03-10550-40	100 OHM RESISTOR ±5% FAILSAFE	1/40	R407	03-10371-70	820 OHM RESISTOR ±5% FILM	2u	
C119				R190				R408	03-0021-40	47 OHM RESISTOR ±5% FILM	1/40	
F	C120	2.2 MFD CAPACITOR ±20% ELEC. 105°C	100V	R121	03-10550-14	0 OHM RESISTOR ±5% FAILSAFE	1/40	R409		300 OHM RESISTOR ±5% FILM	1/40	
C121	22-7722-01	1 MFD CAPACITOR ±20% ELEC. 105°C	100V	R122	03-0021-40	02 OHM RESISTOR ±5%	1/40	R410		100 OHM RESISTOR ±5% FILM	1/40	
C122	22-7013-00	560 PFD CAPACITOR ±10% DISC	50V	R123	03-10550-40	100 OHM RESISTOR ±5% FAILSAFE	1/40	R411	03-0022	15K OHM RESISTOR ±5% FILM	1/40	
C123	22-7013-00	560 PFD CAPACITOR ±10% DISC	50V	R124	03-0021-60	600 OHM RESISTOR ±5% FILM	1/40	R412	03-10551-12	CONTROL 100K OHM BRIGHTNESS	1/40	
C201	22-4005-01	.01 MFD CAPACITOR ±80-20% DISC.	50V	R125	03-00944-00	100K OHM RESISTOR ±5% CARBON COMP.	1/40	R413	03-0022	15K OHM RESISTOR ±5% FILM	1/40	
C202	22-4005-01	.01 MFD CAPACITOR ±80-20% DISC.	50V	R126	03-10551-00	100K OHM RESISTOR ±5% CARBON COMP.	1/40	R414				
C203	22-4005-01	.01 MFD CAPACITOR ±80-20% DISC.	50V	R127	03-10565	1 OHM RESISTOR ±5% FAILSAFE	1/40	R415	03-10012-01	CONTROL 2MEG OHM FOCUS		
C204					45-0797	1K OHM RESISTOR ±5% FAILSAFE	1/40	R416	03-0022-10	60K OHM RESISTOR ±5% FILM	1/40	
E	C205	22-7144-00	220 MFD CAPACITOR ±100% 105°C ELEC.	35V	R128	03-10565	1 OHM RESISTOR ±5% FAILSAFE	1/40	R417	03-0022-40	600K OHM RESISTOR ±5% FILM	1/40
C206	22-7142-03	4.7 MFD CAPACITOR ±100% 105°C ELEC.	25V	R129	03-10565	100K OHM RESISTOR ±5% FAILSAFE	1/40	R418	03-0022	15K OHM RESISTOR ±5% FILM	1/40	
C207	22-4005-01	.01 MFD CAPACITOR ±80-20% DISC.	50V	R130	03-00944-00	100K OHM RESISTOR ±5% CARBON COMP.	1/40	R419				
C301	22-7013-24A	.01 MFD CAPACITOR ±10% DISC	50V	R204	03-7027	10K OHM RESISTOR ±10% CARBON COMP.	1/40	R201	03-7703	330 OHM RESISTOR ±5% CARBON COMP.	1/20	
C302	22-7142	.10 MFD CAPACITOR ±10% POLYESTER	50V	R205	03-7055	47K OHM RESISTOR ±10% CARBON COMP.	1/40	R202	03-7714	1K OHM RESISTOR ±5% CARBON COMP.	1/20	
C303	22-7152-05	22 MFD CAPACITOR ±100-10% ELEC.	25V	R206	03-7771	470 OHM RESISTOR ±10% CARBON COMP.	1/20	R203	03-7700	2.2K OHM RESISTOR ±10% CARBON COMP.	1/20	
C304	22-7120-00	100 MFD CAPACITOR ±20% ELEC. 105°C	50V	R207	03-7055	47K OHM RESISTOR ±10% CARBON COMP.	1/20	R204	03-7027	10K OHM RESISTOR ±10% CARBON COMP.	1/20	
C305	22-7170-03	4.7 MFD CAPACITOR ±10% ELEC.	1KV	R208	03-7771	470 OHM RESISTOR ±10% CARBON COMP.	1/20	R205	03-7055	47K OHM RESISTOR ±10% CARBON COMP.	1/20	
D	C306	22-7013-02A	150 PFD CAPACITOR ±10% DISC	50V	R209	03-0022-21	200K OHM RESISTOR ±5% FILM	1/40	R206	03-7027	10K OHM RESISTOR ±10% CARBON COMP.	1/20
C307	22-7308-02	1 MFD CAPACITOR ±20% ELEC.	25V	R210	03-0022-21	200K OHM RESISTOR ±5% FILM	1/40	R211	03-0022-21	200K OHM RESISTOR ±5% FILM	1/40	
C308	22-7710-00	47 MFD CAPACITOR ±20% ELEC. 105°C	25V	R212	03-0022-02	0.01K OHM RESISTOR ±5% FILM	1/40	R213	03-0022-04	0.01K OHM RESISTOR ±5% FILM	1/40	
C309	22-7152-04	10 MFD CAPACITOR ±100-10% ELEC.	25V	R213	03-0022-04	22K OHM RESISTOR ±5% FILM	1/40	R214	03-0022-04	22K OHM RESISTOR ±5% FILM	1/40	
C310	22-7014-18A	.0033 MFD CAPACITOR ±20% DISC	50V	R214	03-0021-95	0.1K OHM RESISTOR ±5% FILM	1/40	R215	03-0022-10	30K OHM RESISTOR ±5% FILM	1/40	
C311	22-7013-20F	.012 MFD CAPACITOR ±10% DISC.	50V	R215	03-0022-10	30K OHM RESISTOR ±5% FILM	1/40	R216	03-0021-95	0.1K OHM RESISTOR ±5% FILM	1/40	
C312	22-7570-04	1000 MFD CAPACITOR ±10% ELEC. 105°C	1KV	R216	03-0021-40	47 OHM RESISTOR ±5% FILM	1/40	R217	03-0021-40	47 OHM RESISTOR ±5% FILM	1/40	
C313	22-7308-02	1 MFD CAPACITOR ±20% ELEC.	25V	R217	03-10550-30	33 OHM RESISTOR ±5% FAILSAFE	1/40	R218	03-0022-42	200K OHM RESISTOR ±5% FILM	1/40	
C314	22-7014-20A	.0047 MFD CAPACITOR ±20% DISC.	50V	R218	03-0022-42	200K OHM RESISTOR ±5% FILM	1/40	R219	03-0051-13	CONTROL 250K OHM VERT. SIZE		
C	C401	22-7122-00	47 MFD CAPACITOR ±20% ELEC. 105°C	100V	R311	03-0022-23	120K OHM RESISTOR ±5% FILM	1/40	R220	03-0024-40	1.5MEG OHM RESISTOR ±10% FILM	1/40
C402	22-7721-04	4.7 MFD CAPACITOR ±20% ELEC. 105°C	100V	R312	03-0022-00	27K OHM RESISTOR ±5% FILM	1/40	R221	03-0022	27K OHM RESISTOR ±5% FILM	1/40	
C403	22-7013A	100 PFD CAPACITOR ±10% DISC	50V	R313	03-0022-10	30K OHM RESISTOR ±5% FILM	1/40	R222	03-0021-70	1.0K OHM RESISTOR ±5% FILM	1/40	
C404	22-7724	.02 MFD CAPACITOR ±80-20% DISC.	500V	R314	03-0021-70	1.0K OHM RESISTOR ±5% FILM	1/40	R223	03-0022-40	15K OHM RESISTOR ±5% FILM	1/40	
C405	22-3512	.01 MFD CAPACITOR ±40-10% DISC	1KV	R315	03-0022	15K OHM RESISTOR ±5% FILM	1/40	L101	20-3006-02	COIL RCF LINEARITY		
B				R316	03-0021-13	1.0MEG OHM RESISTOR ±5% FILM	1/40	L102	20-3005	COIL RCF TUNABLE WIDTH		



ITEM NUMBER	PART NUMBER	DESCRIPTION	ITEM NUMBER	PART NUMBER	DESCRIPTION
C101	22-7614-06A	330 PFD CAPACITOR $\pm 20\%$ DISC. 50V	RX401	63-10559-32	22 OHM RESISTOR 5% FAILSAFE 1/4W
C102	22-7622-28A	56 PFD CAPACITOR $\pm 10\%$ DISC. 50V	R402	63-7760	270 OHM RESISTOR 5% CARBON COMP. 1/2W
C103	22-7152-03	4.7 MFD CAPACITOR $+100-10\%$ ELEC. 25V	R403	63-7760	270 OHM RESISTOR 5% CARBON COMP. 1/2W
C104	22-7614-24A	.01 PFD CAPACITOR $\pm 20\%$ DISC. 50V	R404	63-7760	270 OHM RESISTOR 5% CARBON COMP. 1/2W
C105			R405		
C106	22-7313	10 MFD CAPACITOR SPECIAL NPZD	R406	63-9921-72	1K OHM RESISTOR 5% FILM 1/4W
CX107	22-7530-08	.018 MFD CAPACITOR SPECIAL 5% 400V	R407	63-9921-72	1K OHM RESISTOR 5% FILM 1/4W
C108	22-7153-07	47 MFD CAPACITOR $+100-10\%$ ELEC. 50V	R408		
C109	22-7152-09	220 MFD CAPACITOR $+100-10\%$ ELEC. 25V	R409	63-9921-40	47 OHM RESISTOR 5% FILM 1/4W
C110			R410		
C111	22-4905-01	.01 MFD CAPACITOR $+80-20\%$ DISC. 500V	R411	63-9921-32	22 OHM RESISTOR 5% FILM 1/4W
C112	22-4905-01	.01 MFD CAPACITOR $+80-20\%$ DISC. 500V	R412	63-9921-40	47 OHM RESISTOR 5% FILM 1/4W
C113	22-3748	.001 MFD CAPACITOR $\pm 10\%$ DISC. 1KV			
C115	22-7152-09	220 MFD CAPACITOR $100-10\%$ ELEC. 25V			
C116	22-7615-09	.033 MFD CAPACITOR $+80-20\%$ DISC. 50V	CR101	103-142-01	DIODE
C301	22-7613-24A	.01 MFD CAPACITOR $\pm 10\%$ DISC. 50V	CR102		
C302	22-7548	.15 MFD CAPACITOR $\pm 10\%$ POLY 50V	CR103		
C303	22-7152-07	47 MFD CAPACITOR $+100-10\%$ ELEC. 25V	CR104	103-298-03A	DIODE
C304	22-7152-09	220 MFD CAPACITOR $+100-10\%$ ELEC. 25V	CR105		
C305	22-7153-07	47 MFD CAPACITOR $+100-10\%$ ELEC. 50V	CR106	103-254-01	DIODE
C306			CR107	103-323-03A	DIODE
C307	22-7152-04	10 MFD CAPACITOR $+100-10\%$ ELEC. 25V	CR108	103-323-03A	DIODE
C308	22-7579-07	470 MFD CAPACITOR $\pm 10\%$ ELEC. 16V	CRII2	103-316-02A	DIODE
C309	22-7614-18A	3300 PFD CAPACITOR $\pm 20\%$ DISC. 50V	CR301	103-336-2IA	DIODE ZENER 12V
C310	22-7389-02	1 MFD CAPACITOR $\pm 20\%$ ELEC. 25V			
C311			L101	20-3943-02	COIL RCF TUNABLE WIDTH
C312	22-7389-02	1 MFD CAPACITOR $\pm 10\%$ ELEC. 25V	L102	20-3906	COIL RCF LINEARITY
C313	22-7389-10	10 MFD CAPACITOR $\pm 10\%$ DISC. 50V			
C316	22-7613-24	.01 MFD CAPACITOR $\pm 10\%$ DISC. 50V			
C401	22-4905-01	.01 MFD CAPACITOR $+80-20\%$ DISC. 500V			
C402	22-7615-04A	220 PFD CAPACITOR $\pm 10\%$ DISC. 50V			
C403	22-7152-03	4.7 MFD CAPACITOR $+100-10\%$ ELEC. 25V	L401	20-3887-10C	COIL RCF 6.8 $\mu$ H
R101	63-9922	15K OHM RESISTOR 5% FILM 1/4W	TX101	95-3136	TRANSFORMER HORIZ. DRIVER
R102	63-9921-66	560 OHM RESISTOR 5% FILM 1/4W	TX201	95-3479	TRANSFORMER H.V. SWEEP
RX103	63-10559-24	10 OHM RESISTOR 5% FAILSAFE 1/4W	TX202	95-3397-02	TRANSFORMER DEFLECTION YOKE
RX104	63-10559-24	10 OHM RESISTOR 5% FAILSAFE 1/4W			
R105			Q101	121-1070	TRANSISTOR HORIZ. OUTPUT
R106	63-9921-46	82 OHM RESISTOR 5% FILM 1/4W			
RX107	63-10559-48	100 OHM RESISTOR 5% FAILSAFE 1/4W			
R108	63-7838	18K OHM RESISTOR 10% CARBON COMP. 1/2W	Q401	121-1058	TRANSISTOR VIDEO OUTPUT
R109	63-10811-04	CONTROL 100K BRIGHTNESS	Q402	121-895	TRANSISTOR VIDEO DRIVER
R110					
R111	63-9922	15K OHM RESISTOR 5% FILM 1/4W	S101	223-15-04	INT. CKT. THICK FILM SUBSTRATE HORIZ.
R112					
R113	63-10824	RESISTOR H.V. BLEEDER 160 MEG. 1/4W			
R114	63-10182-54	2.7 MEG OHM RESISTOR 5% CARBON			
R115			S301	223-14	INT. CKT. THICK FILM SUBSTRATE VERT.
R116	63-10670-04	CONTROL 6 MEG. FOCUS			
R117			VX201	100-708	12" CRT
R118	63-10811-03	CONTROL 25K PHASE (ALT. 63-10651-11)			
R119					
R120	63-9921-68	680 OHM RESISTOR 5% CARBON COMP. 1/4W			
R121					
R301	63-9921-92	6.8K OHM RESISTOR 5% FILM 1/4W			
R302	63-10811-05	CONTROL 250K VERT SIZE. (ALT. 63-10651-13)			
R303	63-9922-06	27K OHM RESISTOR 5% FILM 1/4W			
R304	63-9922-06	27K OHM RESISTOR 5% FILM 1/4W			
R305	63-9921-72	1K OHM RESISTOR 5% FILM 1/4W			
R306	63-9921-10	2.7 OHM RESISTOR 5% FILM 1/4W			
R307	63-8803	22K OHM RESISTOR 5% FILM 1/4W			
R308					
R309					
R310					
R311					
R312					
R313					
R314	63-9921-84	3.3K OHM RESISTOR 5% FILM 1/4W			
R315	63-09921-88	4.7K OHM RESISTOR 5% FILM 1/4W			